



EPA Forum on Managing Contaminated Sediments at Hazardous Waste Sites

Site Characterization Panel

Standardizing Contaminated Sediment Site Characterization

Tim Drexler
FIELDs Team Manager
drexler.timothy@epa.gov

Characterization Tools



- Compile Historical Data
- Acquire New Data
 - Bathymetric surveys
 - Sediment thickness survey
 - Sample design/collection
- Interpret Data
 - Interpolate sample data
- Model the Site
 - Average concentrations for decision support
 - Mass and volume calculation
 - 2 and 3 dimensional visualization

Historical Data

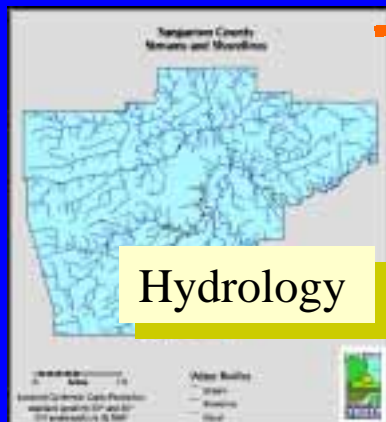
- Existing sample databases
- Current/historical images
- GIS coverages
- HH/Eco Studies
- Other information



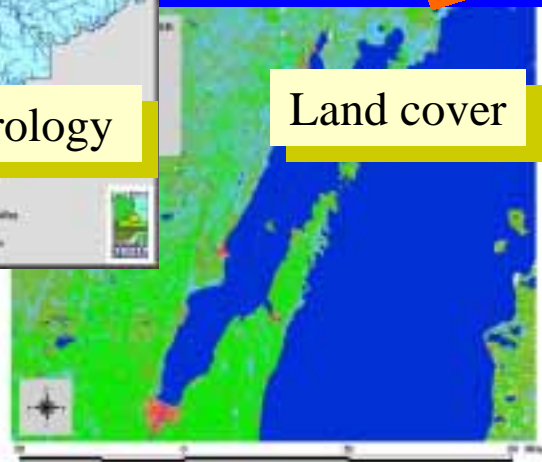
Digital Orthoquads



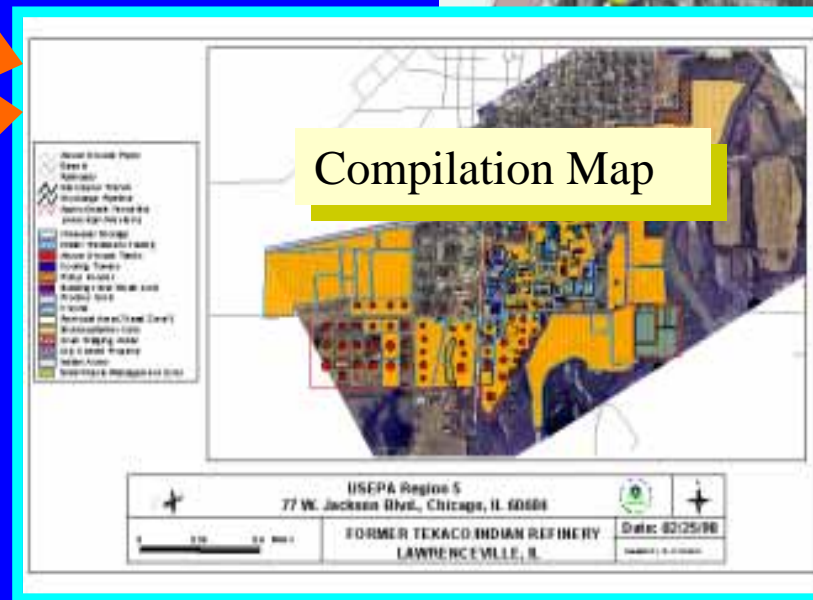
Features from GPS



Hydrology



Land cover

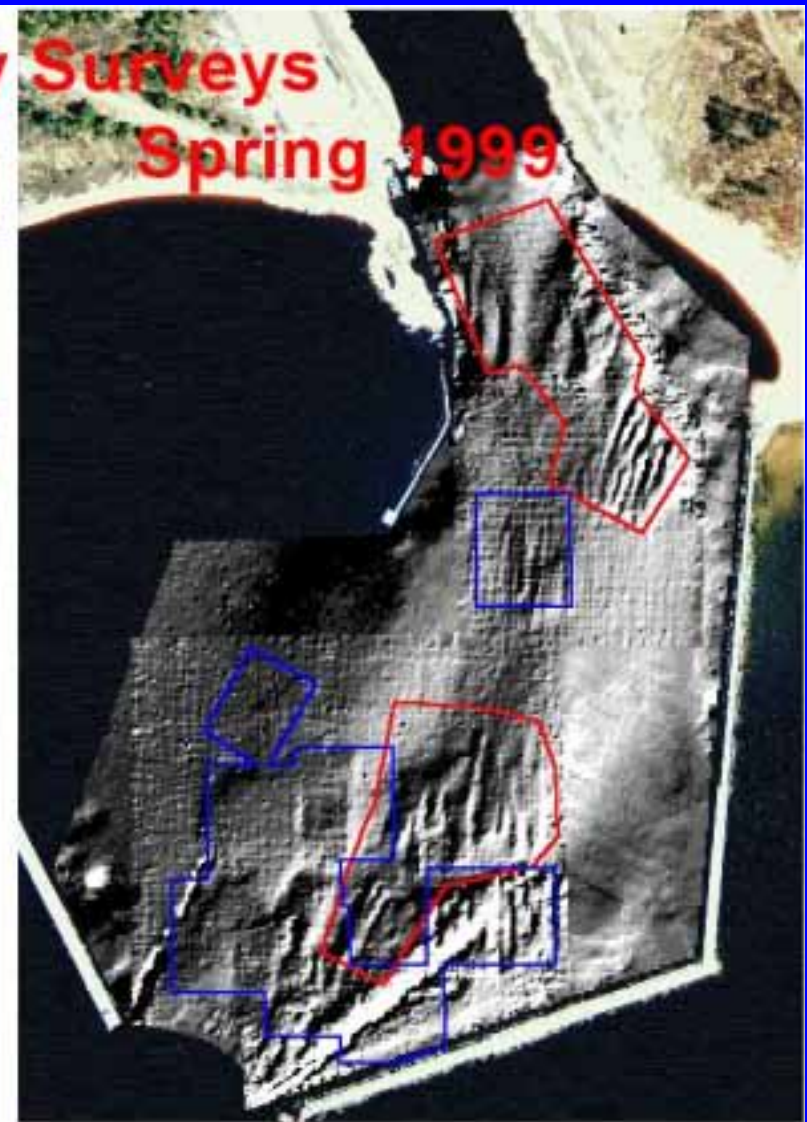


Compilation Map

Acquiring New Data: Bathymetry

- Not too difficult or expensive
- Lots of potential information
 - ID Scour & Fill areas
 - Bottom character
 - Sample elevation data
- Requires:
 - Submeter DGPS
 - Planned lines
 - High data density
 - Tide correction?
 - Perform after winter/spring storm events

Bathymetric Surveys

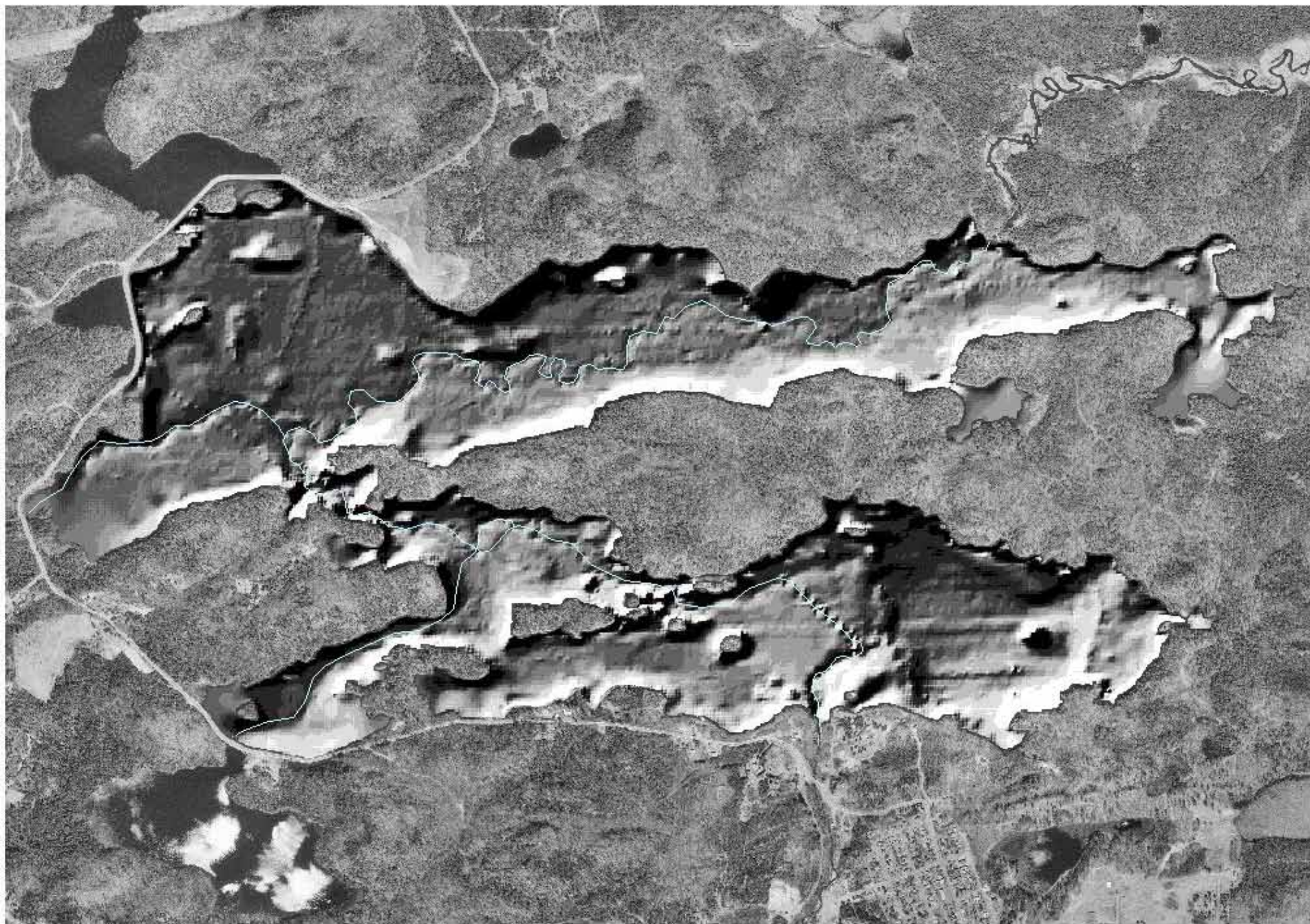


50 0 50 100 Meters



1998 dredge area
1997 dredge area

50 0 50 100 Meters



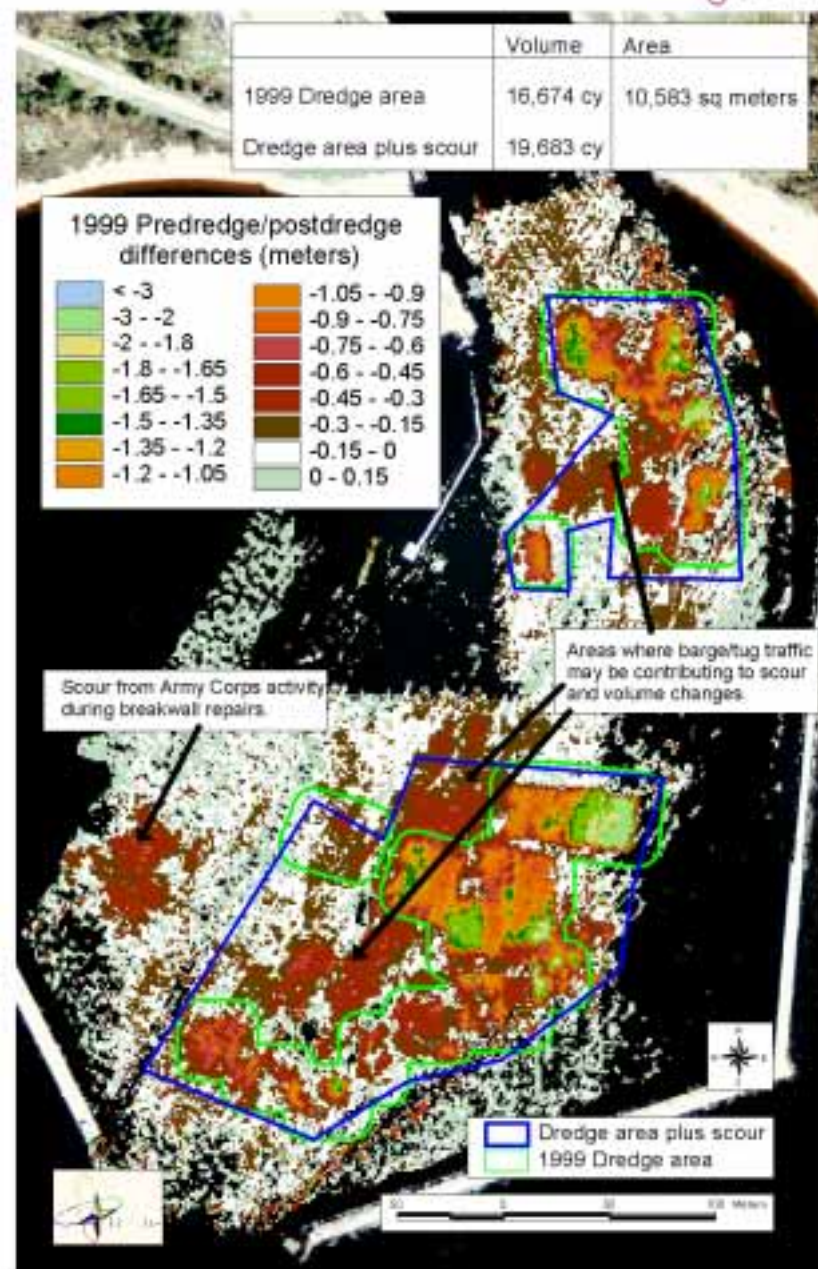
Deer Lake: Hillshade of the May 2000 bathymetric survey. Survey lines were 20 m apart with a total of 142,802 readings. 10 Jan. 01

500 0 500 1000 Meters



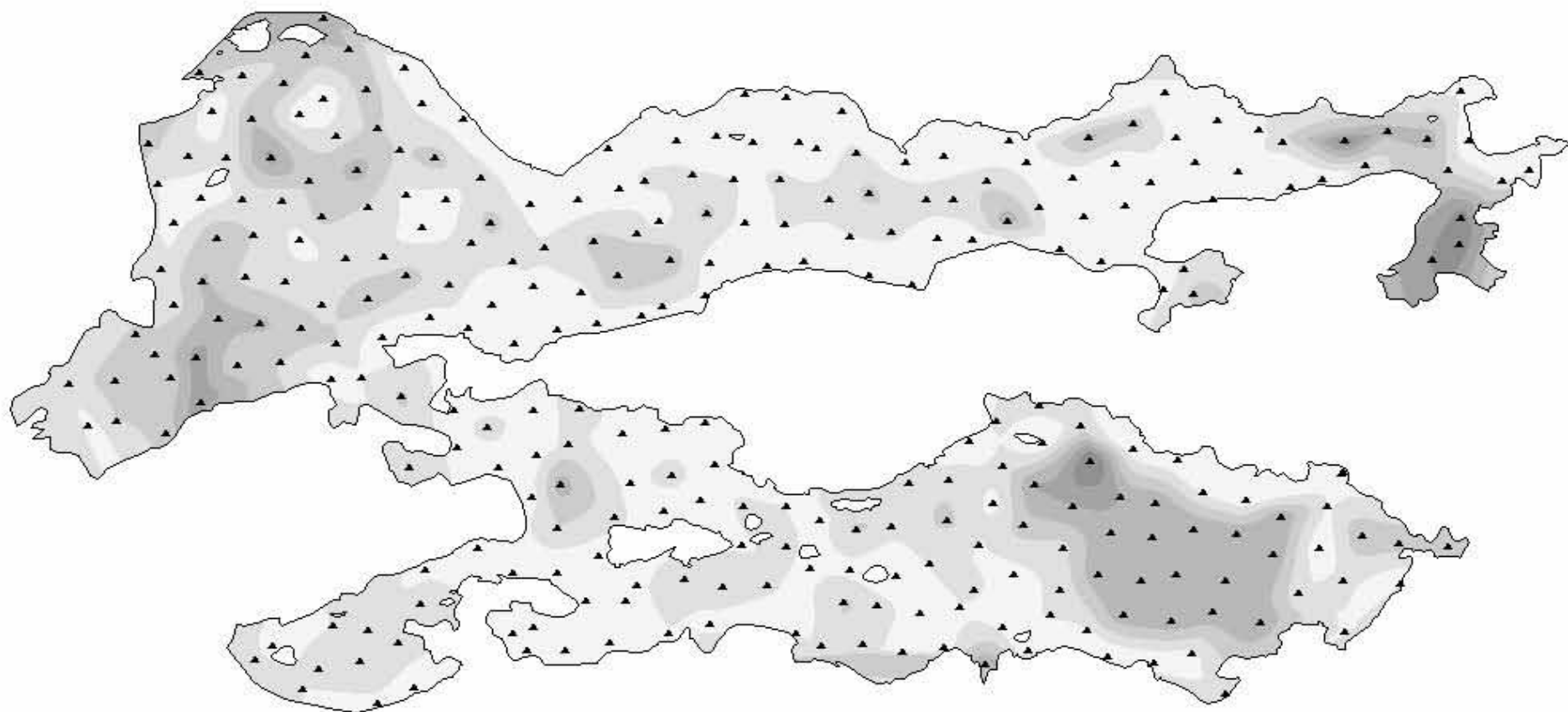
Manistique Harbor

Hillshade of the bathymetry survey for November 1999, after the '99 dredge season. Dredge areas in red.



Determine Sediment Thickness

- Manual probes to resistant layers
- Other help:
 - GPR?
 - Seismic Profiling?
 - Chirp devices?



500 0 500 1000 Meters

Deer Lake: Sediment thickness profile from 294 sediment pokes performed in May 2000. The July 2000 sample design for mercury contamination was based on sampling areas with sediment less than 1.5 ft by Ponar dredge and greater than 1.5 ft by Vibrocores. 10 Jan. 01

Legend



Create Sample Designs

- Statistically based-when possible
 - hot spot search
- Collect accurate spatial information
- Determine spatial correlation of values
 - multi-staged sampling?
- Sediment detail for facies correlation

Statistically based Sample Design

Sample Design Modeling Analysis Tools

JUDGMENTAL

Add Points

RANDOM

Simple

Stratified

SYSTEMATIC

Aligned Grid (Hot Spot Search)

Unaligned Grid

LINEAR

Make Centerline

Use Linear Tools

TOOLS

Modify Design

Find Largest Unsampled Area

Load to GPS

Print Design

Aligned Grid Sample Design (Hot Spot Search)

Starting ID#: 916001

SAMPLE DESIGN INPUT

Sampling Area

Theme: bor99a_poly.shp

Area: 145988 sq m

Hot Spot Shape

☒ Circle

☐ Ellipse 0.9

☐ Ellipse 0.7

☐ Ellipse 0.5

Beta

☐ 5%

☒ 10%

☐ 15%

☐ 20%

Grid Shape

☒ Square

☐ Triangle

☐ Rectangle

☒ Random Start

DESIGNATE KEY VARIABLE

☒ Hot Spot Size (m)

☐ # of Sampling Locations

☐ Distance Between Samples (m)

L:

n:

G:

(L = 1/2 the total length of the hot spot of interest)

Calculate other 2 variables

Clear Rotation

Apply

Save

Cancel

Sample Design



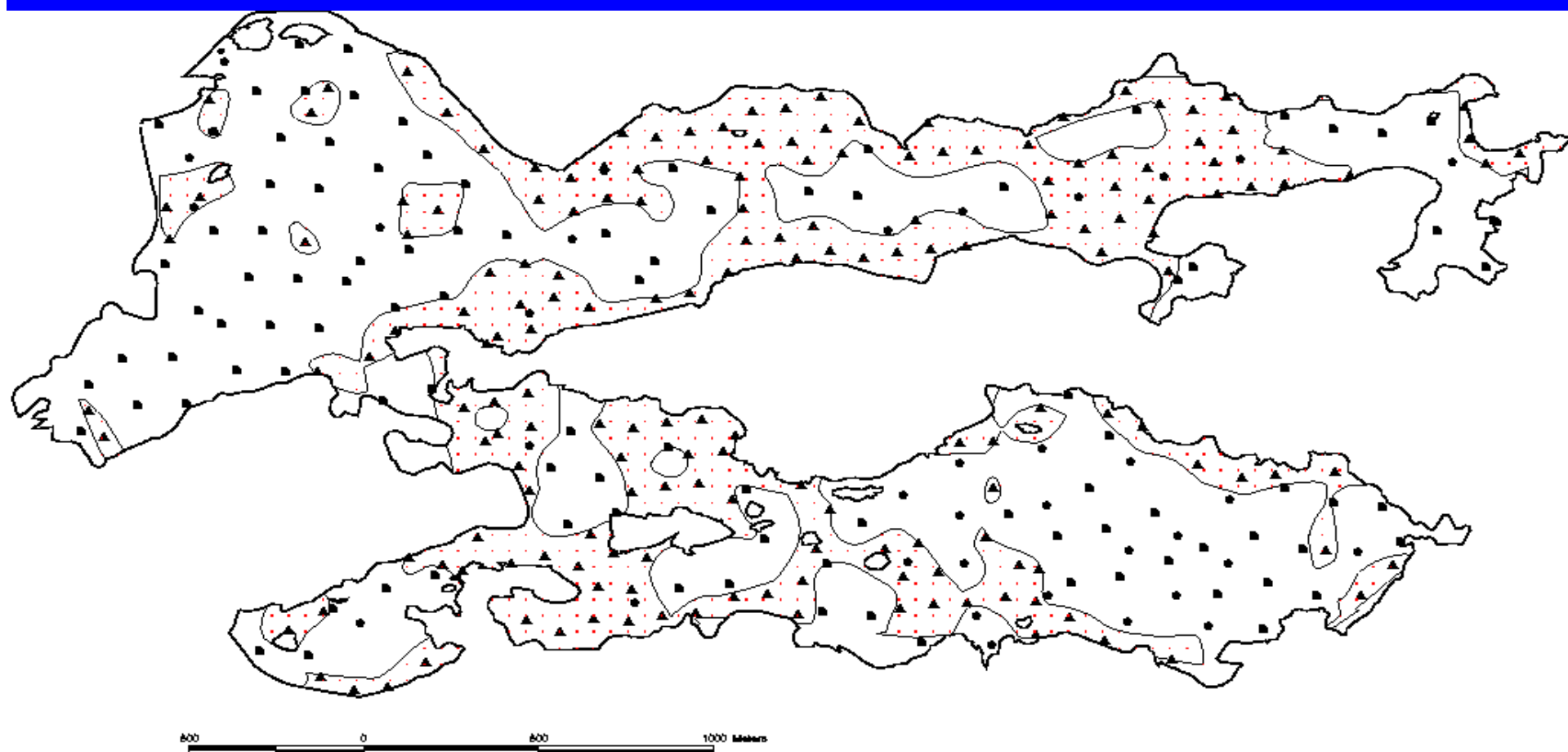


Figure 3. Deer Lake: Sample design for mercury sampling July 2000. 100 cores were planned in areas with more than 1.5 ft of sediment, and 180 ponars were planned for areas with less than 1.5 ft of sediment. 10 Jan. 01

